Defecation Induced Deep Venous Thrombosis

A Case Report

Ghee CHEW, MD, Wei-Ber Liao, MD, Tsu-Shiu Hsu,* MD, and Michael J. Bullard, MD

Summary

While the risk of deep venous thrombosis (DVT) during prolonged flights is well recognized, we present the case of a 54-year-old male who suffered a deep venous thrombosis following defecation. Defecation, through a combination of the Valsalva maneuver and squatting, led to a DVT due to venous stasis, most marked in the left leg. Color-duplex scanning not only proved a convenient diagnostic tool but also allowed for monitoring and documentation of popliteal and saphenous vein recanalization. Being non-invasive and complication-free, color-duplex scanning should be considered for any patient in whom DVT is a possibility. (Jpn Heart J 1996; 37: 409–415)

Key words: Defecation  Deep venous thrombosis  Left lower extremity  Color-duplex echocardiography  Abdominal computed tomography

The annual incidence of a first episode of clinically suspected deep venous thrombosis (DVT) has been estimated to be 2–3 per 1000 in the general population. It is estimated that the annual incidence of recognizable deep venous thrombosis in the United States is approximately 250,000 and that more than 100,000 patients die each year of pulmonary embolism. Long-term sequelae including recurrent deep venous thrombosis, venous insufficiency and the postphlebitic syndrome, have been shown to be morbidly disabling. Prompt, accurate identification and treatment of thrombi are needed to prevent or lessen these complications. Clinical diagnosis of deep venous thrombosis has been shown to be inaccurate. One-third of suspected patients do have deep venous thrombosis, while the remaining patients often have transient abnormalities of the musculo-skeletal system or skin, which may mimic an acute venous thrombosis but do not require anticoagulant therapy. Hospitalization and initiation of anticoagulation therapy in all patients with suspected venous
thrombosis is both too expensive and runs unnecessary risks of bleeding.\textsuperscript{5,6} The diagnosis of deep venous thrombosis, therefore, relies heavily on the use of objective tests. While ascending phlebography is the gold standard for the diagnosis of deep venous thrombosis, it is invasive, uncomfortable, lacks repeatability and is associated with its own intrinsic morbidity, including ulceration after dye extravasation and postphlebographic venous thrombosis.\textsuperscript{7-9} Color-duplex scanning has the advantage of conventional duplex imaging and facilitates the identification of veins, making it the non-invasive method of choice for evaluating patients with suspected deep venous thrombosis.\textsuperscript{10} The following case offers both an unusual presentation of a DVT and demonstrates the efficacy of color-duplex scanning and CT scanning in following the nature, progression and efficacy of treatment.

**Case Report**

A 54 year old male presented with complaints of sudden onset of left leg pain with associated swelling and pallor upon standing, after defecating for 10 minutes in a squatting position. He was a previously healthy farmer with a 30 year history of smoking 2 packages of cigarettes per day. Being unable to walk he came immediately to the Emergency Department.

His vital signs were: temperature 36\degree C, pulse rate 68/min, respiratory rate 19/min and blood pressure 117/68 mmHg. He was alert. He had normal heart sounds with equal distal pulses. His pulmonary and abdominal exams were unremarkable. The maximal circumference of the left thigh was 59 centimeters and left calf 40 centimeters with the corresponding measurements of the right leg 52 and 34 centimeters, respectively. The chest X-ray was normal.

A deep venous thrombosis was suspected, so a strain gauge plethysmography and color-duplex scanning were arranged. Both were abnormal with the color-duplex scanning showing a complete occlusion from the common femoral vein down to the popliteal vein with a smoky (packed and slowly moving) echo appearance (Figure A). The tibioperoneal vein exhibited color flow when compressed distally. An abdominal computed tomography (CT) was performed which showed a filling defect in the distal inferior vena cava (Figure B) and complete obstruction of the left common iliac vein, which was filled with thrombus and compressed by the right common iliac artery against the vertebral body, where it came off the inferior vena cava (Figure C). The patient was given recombinant tissue plasminogen activator (r-TPA), 50 mg intravenously over 60 minutes, followed by heparin. We used color-duplex scanning to follow the patient’s progress. The smoky echo picture changed to a heterogenous appearance on the 4th day. Recanalization as evidenced by color flow in the popliteal
Figure. A: Complete obstruction of the left femoral vein down to the popliteal vein. LSV = long saphenous vein; CFV = common femoral vein. B: A filling defect in the distal inferior vena cava (arrowhead) just before the bifurcation. C: Left common iliac vein filled with thrombus (arrowhead) compressed by right common iliac artery (arrow) to the vertebral body where it comes off the inferior vena cava. D: The left common iliac vein shrunk down to a linear structure (arrowhead) and was still compressed by the right common iliac artery (arrow).

vein was present on the 7th day and in the long saphenous vein on the 15th day. The common femoral vein and superficial deep femoral vein were still completely occluded. The leg pain subsided on the 6th day and the leg swelling began going down on the 8th day. The patient was discharged on coumadin 16 days after admission and followed at our Cardiovascular Outpatient Department. One week later, he began complaining of intermittent left leg swelling and discomfort. Coumadin was continued for 3 months and an abdominal CT was ordered to evaluate the leg swelling. It showed that the enlarged and compressed left common iliac vein had been replaced by a shrunken linear structure (Figure D) with the collateral circulation from the left common femoral vein to the right common femoral vein markedly increased. The left common femoral vein thrombosis persisted.
DISCUSSION

Venous thrombi are intravascular deposits of fibrin, platelets, granulation tissue and red blood cells. Once initiated, the thrombus is immediately stabilized by fibrin. Over the next 24–48 hours, complete fibrinization is accomplished. Gradual lysis of the thrombus by the fibrinolytic enzyme system then begins. This continues until the thrombus is either dissolved or organized. This process is usually incomplete and is associated with a significant incidence of venous valvular injury and incompetency. Then modest or extensive luminal narrowing of the vessel may occur. Recanalization and organization of venous thrombi become apparent after about 1 week and continue to become more pronounced as the clot ages. In this patient, these changes were well demonstrated by color-duplex scanning and abdominal computed tomography. The acute stage was marked by a smoky echo appearance on the first day. Organization followed in a few days with recanalization from the popliteal to the long saphenous vein beginning by the end of the first week. This was also identified using color duplex. The enlarged and compressed left common iliac vein then fibrosed and shrunk down to a linear structure as shown by the abdominal CT performed 3 months later.

The clinical factors that predispose to thrombus formation, as pointed out by Virchow, include a hypercoagulable state, vascular damage and stasis. Stasis and vascular damage appear to be the most important contributory factors. An efficient venous return from the lower limbs is of major importance in preventing venous thrombi. The left leg has been found to be statistically more likely to suffer acute thrombosis than the right leg. Possible anatomic explanations include: the right common iliac vein is much shorter than the left, and has fewer potentially-compressing structures impinging on it, the left common iliac vein has a smaller diameter, has an acutely angled outflow to the inferior vena cava, and is traversed by the right common iliac artery. This patient suffered a DVT in association with defecation. Forced expiration against a closed glottis during defecation acts like a Valsalva maneuver and causes venous pressure to rise as a result of decreased venous return to the heart. Compression of the distended left common iliac vein by the overlying right common iliac artery and the vertebral body may produce severe venous stasis. Defecation induced DVT is undoubtedly rare but the combination of increased intraabdominal pressure and the impediment to venous return would appear to be ideal conditions for the development of thrombus and DVT.

Contrast venography is currently the most accurate diagnostic method, but its disadvantages include invasiveness, lack of portability, contrast material toxicity, local irritation, exacerbation of congestive heart failure and renal failure and potential toxicity to the venous endothelium leading to thrombus formation.
Duplex scanning for the diagnosis of venous thrombosis has been demonstrated to be accurate and reproducible. It is easy to perform, painless, non-invasive, portable and requires minimal patient cooperation. The ability to study patients who are confined in an intensive care unit or restrained by complex orthopedic traction devices is a major advantage when compared with other tests. Ultrasound is also capable of identifying other causes of leg swelling including muscle tear, calf hematoma, popliteal cyst, compressing tumor and other unusual causes of extrinsic compression. The method provides not only excellent visualization of both upper and lower leg veins but also information as to age of the thrombi (acute versus chronic). Studies in symptomatic patients have consistently shown a high sensitivity and specificity (97% and 97%) for proximal deep venous thrombosis.

Conventional duplex imaging, however, has its drawbacks. Errors continue to be made in the detection of thrombi located in the calf veins and femoral adductor canal region. The drawbacks can be decreased by using color-flow duplex echocardiography. Color-flow duplex echocardiography is a combination of color Doppler and B-mode echocardiography. A 7.5 MHz probe is used to study superficial veins and a 5.0 MHz probe to study more deeply situated venous segments. Stationary tissues are displayed as a B-mode gray scale image, whereas moving particles (erythrocytes) generate a Doppler-shift frequency. Color coding of flow (red or blue) is dependent on the direction relative to the orientation of the sound beam. Centrally directed venous flow was assigned a blue color and peripherally directed arterial flow a red color. Color saturation or hue reflects the magnitude of the frequency shift, which is dependent on flow velocity and the angle at which the ultrasonic beam intersects the velocity vector. Thus deeper or more intense colors correspond to lower frequency shifts, and decreased color saturation and whiter shades of red and blue correspond to higher frequency shifts. A total lack of color is indicative of the absence of flow, flow velocities of less than 0.3 cm/sec, or flow vectors at a right angle to the sound beam. Compared with conventional duplex imaging, color-flow duplex scanning facilitates the identification of veins (especially below the knee), decreases the need to assess Doppler flow patterns and venous compressibility, and allows veins to be surveyed longitudinally. These advantages translate into a less demanding and time-consuming examination. Because color-flow duplex scanning is as accurate as conventional duplex imaging, its advantages make it the non-invasive method of choice for evaluating patients with suspected deep venous thrombosis.

Anticoagulant therapy is highly effective in preventing thrombus extension or embolization but does not produce significant thrombolysis and its use is associated with an appreciable rate of post-thrombotic syndrome. Thrombolytic
therapy induces lysis of thrombi and therefore has the potential to prevent venous valve damage and reduce the incidence of the post-thrombotic syndrome.21-26) R-TPA was used to treat this patient and the only side effect was mild gum bleeding which stopped spontaneously. Thrombolysis, however, proved unsatisfactory because the left common iliac vein progressively collapsed and the DVT persisted. The efficacy of lysis might be enhanced by administering a higher dose of r-TPA or over a much shorter period of time, such as 15 to 30 minutes, however, this requires further evaluation.

While the outcome was less satisfactory, color-duplex scanning rapidly confirmed the diagnosis of DVT in a patient who presented with complaints of leg pain and swelling immediately following defecation.

REFERENCES


